SONGS OF THE CHIPPING SPARROW

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Songs of the Chipping Sparrow (*Spizella passerina*) have been described (Saunders, 1935, p. 263; Peterson, 1947, p. 235) as a simple trill or rapid series of notes, all on one pitch, and of a dull and unmusical quality. The only variations mentioned are in speed ("fast" or "slow") and in the number of notes in the song. The notes of the song are generally uttered too rapidly to count, but Saunders believed their number was usually a multiple of eight; Brand and Axtell (1938) found variations of 11 to 52 in the number of notes in thirteen songs recorded on sound film. Apparently nothing is known of the detailed character of the individual notes and their variation in different songs.

This paper is based on a study of 58 Chipping Sparrow recordings in the collection of tape recordings of the Laboratory for the Study of Animal Sounds, Department of Zoology and Entomology, Ohio State University. These recordings (see table 1) include 39 from Ohio, 12 from Maine, three from West Virginia, three from Pennsylvania, and one from Michigan, and contain a total of 461 songs. Four of the Ohio recordings (the first four listed in table 1) were made with a Brush Soundmirror recorder using a tape speed of seven and one-half inches per second; the remainder were made with a Magnemite, Model 610–E, using a tape speed of 15 inches per second. All were made by the writer (a few with the assistance of Dr. Carl R. Reese). These recordings have been analyzed with a Vibralyzer (Borror and Reese, 1953), and graphs made of the different patterns found. The number of notes or phrases in each song have been counted by playing the tapes at a reduced speed.

The graphs show that the songs of this species are not as simple as the published descriptions would lead one to believe, and that there is a considerable amount of variation in the songs of different birds.

Characteristics of Chipping Sparrow Songs

Chipping Sparrow songs are trills. A trill is a series of similar notes or phrases uttered too fast to count (more than six per second), up to about 30 per second. If similar notes or phrases are uttered faster than about 30 per second they sound buzzy. If a note is fluctuated up and down in pitch at rates exceeding about 30 per second, we describe it as being buzzy in quality. A simple trill is one in which all the phrases are alike (or, the first and/or last phrase may be incomplete); a two-parted trill contains a series of phrases of one type, then a series of phrases of another type. Chipping Sparrow songs are generally simple trills; only one song in the 461 studied was a two-parted trill.

The individual phrases of the song contain from one to three slurred notes (fig. 1–41). The slurring is usually quite rapid, in some cases over an octave or more in 0.01 second; it is this rapid slurring of the notes that gives the song its dull and unmusical quality. The notes are usually clear, but in a few songs (fig. 1–4) each phrase contains a buzzy note. The notes may be up-slurred or down-slurred (or both); the phrases in most songs contain both up-slurred and down-slurred elements.

Several characteristics of the recorded songs studied are summarized in table 2; the calculations were run using more decimal places than are given in this table. The phrase length includes the length of the notes in the phrase, plus the silent interval between the notes of successive phrases; this was calculated from the graphs as the average length in about a second of the song. Very little variation, never more than a few thousandths of a second, was found in the length of different

TABLE 1

Chipping Sparrow recordings studied

No. of Recording	Locality	Date	No. of Songs
84	Sugar Grove, Ohio	May 28, 1948	10
113	Columbus, Ohio	April 26, 1949	22
166	Worthington, Ohio	May 3, 1950	29
273	Columbus, Ohio	April 9, 1952	10
372	Columbus, Ohio	April 5, 1953	5
413	Worthington, Ohio	April 18, 1953	4
414	Columbus, Ohio	April 25, 1953	9
508	Lakeside, Ohio	May 17, 1953	6
608	Lincoln Co., Me.	July 20, 1953	14
666	Worthington, Ohio	May 30, 1953	4
797	Worthington, Ohio	April 30, 1954	14
799	Worthington, Ohio	April 30, 1954	5
952	Worthington, Ohio	May 2, 1954	7
953	Worthington, Ohio	May 2, 1954	8
954	Worthington, Ohio	May 2, 1954	9
986	Columbus, Ohio	May 9, 1954	7
1013	Lancaster, Ohio	May 14, 1954	11
1298	Columbus, Ohio	April 14, 1955	9
1306	Zaleski, Ohio	April 16, 1955	7
1482B	Lincoln Co., Me.	June 14, 1955	2
1527B	Lincoln Co., Me.	July 7, 1955	12
1686	New Albany, Ohio	April 13, 1956	9
1702	University Park, Pa.	April 18, 1956	4
1703	University Park, Pa.	April 18, 1956	4
1705	University Park, Pa.	April 18, 1956	3
1718	New Albany, Ohio	April 27, 1956	6
1719	New Albany, Ohio	April 27, 1956	8
1746	New Albany, Ohio	April 29, 1956	8
1770	New Albany, Ohio	May 3, 1956	10
1974	Adams Co., Ohio	June 2, 1956	8
1980	Adams Co., Ohio	June 2, 1956	6
2045	Lincoln Co., Me.	June 16, 1956	4
2053	Lincoln Co., Me.	June 20, 1956	6
2064	Lincoln Co., Me.	June 20, 1956	8
2223	Lincoln Co., Me.	July 28, 1956	13
2477	New Albany, Ohio	April 27, 1957	8
2643	Westerville, Ohio	May 15, 1957	3
2645	New Albany, Ohio	May 15, 1957	1
2760	Oscoda Co., Mich.	May 30, 1957	8
2819	Hocking Co., Ohio	June 2, 1957	7
2997	Lincoln Co., Me.	July 14, 1957	5
2998	Lincoln Co., Me.	July 14, 1957	10
3017	Jefferson, Me.	July 21, 1957	9
3244	Columbus, Ohio	April 20, 1958	11
3248	Columbus, Ohio	April 20, 1958	1
3249	Columbus, Ohio	April 20, 1958	9
3250	Columbus, Ohio	April 23, 1958	4
3251	Columbus, Ohio	April 23, 1958	6
3263	Wheeling, W. Va.	April 25, 1958	2
3268	Wheeling, W. Va.	April 25, 1958	8
3279	Wheeling, W. Va.	April 26, 1958	7
3287	New Albany, Ohio	April 30, 1958	8
3299	New Albany, Ohio	April 30, 1958	10
3303	Reynoldsburg, Ohio	May 1, 1958	6
3328	Worthington, Ohio	May 7, 1958	6
3381	Highland Co., Ohio	May 11, 1958	7
3529	Wiscasset, Me.	June 28, 1958	10
3663	Lincoln Co., Me.	July 29, 1958	13

TABLE 2

Characteristics of Chipping Sparrow songs

No. of Recording	Song Pattern Patt. No.	Song Pattern Fig.* No.	No. of Phrases Range	No. of Phrases Average	Silent Interval Between Phrases (sec.)	Song Length (sec.) Range	Song Length (sec.) Average	Phrase Length (sec.)	Phrases per Second
84	5	(7)	42–58	50.50	0.040	2.61–3.61	3.14	0.063	15.9
113	25	(38)	15–32	24.32	0.040	1.64–3.55	2.68	0.112	8.9
166	25	(38)	17–24	21.28	0.044	1.67–2.38	2.10	0.101	9.9
273	14	(23)	32–46	41.60	0.030	1.76–2.54	2.29	0.056	17.9
372	16	(25)	26–29	27.60	0.027	2.55–2.85	2.71	0.099	10.1
413	19	(30)	37–47	44.25	0.022	2.13–2.71	2.55	0.058	17.2
414	16	(25)	26–31	28.67	0.014	2.36–2.82	2.60	0.091	11.0
508	21	32	29–35	31.67	0.029	2.32–2.80	2.53	0.081	12.4
608	4	6	50–61	55.57	0.016	2.47–3.02	2.75	0.050	20.1
666	17	26	20–29	24.25	0.026	2.17–3.15	2.63	0.110	9.1
797	7	9	36–71	51.71	0.027	2.50–4.95	3.60	0.070	14.3
799	4	5	57–63	58.80	0.021	2.51–2.78	2.59	0.044	22.5
952	17	(26)	23–33	27.14	0.026	2.46–3.55	2.91	0.108	9.2
953	10	16	25–29	27.00	0.025	1.77–2.06	1.92	0.072	13.9
954	19	30	47–72	53.00	0.025	2.70–4.14	3.04	0.058	17.3
986	11	17	13–18	14.57	0.063	1.82–2.54	2.04	0.145	6.9
1013	2	(3)	14–63	32.45	0.020	1.06–4.88	2.50	0.078	12.8
1298	10	12	17–23	20.78	0.030	1.74–2.36	2.13	0.104	9.6
1306	10	(12)	26–32	29.00	0.024	2.45–3.02	2.74	0.095	10.5
1482B	1	1	63–70	66.50	0.026	3.10–3.45	3.28	0.050	20.1
1527B	16	25	22–27	23.58	0.030	2.03–2.49	2.17	0.093	10.7
1686	12	20	18–23	21.11	0.029	1.83–2.35	2.15	0.103	9.7
1702	23	36	13–28	21.50	0.022	1.25–2.71	2.07	0.098	10.3
1703	9	(11)	10–22	16.40	0.046	1.25–2.81	2.08	0.130	7.7
1705	9	11	17–23	20.00	0.042	2.10–2.86	2.48	0.126	7.9
1718	18	29	11–21	18.00	0.031	1.54–2.97	2.54	0.143	7.0
1719	26	39	33–39	35.00	0.022	1.88–2.22	1.99	0.057	17.4
1746	22	(33)	21–53	33.38	0.025	1.29–3.28	2.06	0.062	16.0
1770	22	33	20–31	28.10	0.026	1.22–1.91	1.73	0.063	15.9
1974	25	38	33–47	40.00	0.025	2.47–3.52	2.99	0.075	13.3
1980	22	34	42–49	45.67	0.023	2.51–2.93	2.73	0.060	16.6
2045	18	(28)	20–28	25.25	0.031	2.66–3.74	3.37	0.135	7.4
2053	14	22	28–53	43.83	0.025	1.55–2.95	2.44	0.056	17.8
2064	18	28	24–35	28.00	0.028	3.21–4.69	3.75	0.135	7.4
2223	24	37	21–39	32.00	0.026	1.54–2.89	2.36	0.075	13.4
2477	15	24	40–55	46.63	0.021	2.80–3.86	3.27	0.071	14.2
2643	17	(26)	19–21	20.00	0.011	1.77–1.96	1.86	0.094	10.7
2645	8	10	66	66.00	0.032	6.86	6.86	0.104	9.6
2760	13	21	35–53	46.13	0.021	1.95–2.96	2.57	0.056	17.8
2819	10	(15)	20–30	24.00	0.037	2.04–3.09	2.46	0.104	9.6
2997	17	27	19–29	22.00	0.035	2.17–3.34	2.52	0.116	8.6
2998	10	15	9–37	24.40	0.035	0.94–3.65	2.61	0.108	9.2
3017	2	3	27–36	32.33	0.056	2.05–2.76	2.47	0.078	12.8
3244	10	14	20–23	21.50	0.030	1.74–2.01	1.88	0.089	11.3
					0.045			0.116	8.6
3248	28	41	4+30†	34.00		2.36	2.36		
					0.025			0.064	15.6
3249	11	18	18–27	21.22	0.040	2.10–3.17	2.49	0.119	8.4
3250	20	31	19–24	22.00	0.030	1.87–2.37	2.17	0.100	10.0
3251	10	(13)	22–27	24.00	0.030	2.30–2.83	2.51	0.106	9.4
3263	6	8	16–24	20.00	0.070	1.72–2.62	2.17	0.112	8.9
3268	27	40	21–26	23.25	0.030	2.10–2.61	2.33	0.102	9.9
3279	12	19	26–31	28.29	0.035	2.37–2.84	2.59	0.093	10.8
3287	1	2	45–54	49.88	0.026	2.24–2.69	2.48	0.050	19.9
3299	22	35	36–60	50.00	0.025	2.10–3.51	2.93	0.059	16.9

TABLE 2—(*Continued*)

No. of Recording	Song Pattern Patt. No.	Song Pattern Fig.* No.	No. of Phrases Range	No. of Phrases Average	Silent Interval Between Phrases (sec.)	Song Length (sec.) Range	Song Length (sec.) Average	Phrase Length (sec.)	Phrases per Second
3303	5	7	37–40	38.67	0.030	2.06–2.23	2.16	0.057	17.7
3328	14	23	40–50	45.17	0.026	1.99–2.49	2.25	0.050	19.9
3381	10	13	33–52	39.00	0.030	2.84–4.49	3.36	0.087	11.5
3529	3	4	26–28	27.10	0.030	2.54–2.74	2.65	0.099	10.1
3663	14	(22)	27–61	44.54	0.030	1.59–3.63	2.64	0.060	16.7
All Recordings¶			9–72	33.31	0.030	0.94–6.86	2.61	0.087	11.5 ‡

*Numbers in parentheses represent figures showing the pattern in the recording, but were made from a song in another recording.

†The one song in this recording was two-parted, with 4 phrases in the first part and 30 phrases in the second part; the phrases in the first part were longer than those in the second part.

¶The averages are based on the averages of the 58 recordings.

‡The figure of 11.5 phrases per second is based on an average phrase length of 0.087 sec.

phrases in the same song. Song length was calculated by multiplying one less than the number of phrases by the phrase length, and adding the length of the notes in the last phrase.

Number of phrases.—The number of phrases in the songs studied varied from 9 to 72, and averaged 33.31. A few songs whose phrases were two- or three-noted had the last phrase incomplete. The number of phrases in the 461 songs is shown graphically in figure 42; in preparing this figure a partial final phrase was counted as a complete phrase. Neither these counts nor those of Brand and Axtell (op. cit.) support Saunders' contention that the number of notes in Chipping Sparrow songs is usually a multiple of eight.

Phrase length and rate.—The phrase length, measured from the beginning of one phrase to the beginning of the next, varied from 0.044 to 0.145 (average, 0.087) second; this corresponds to a variation in rate of from 22.5 to 6.9 (average, 11.5) phrases per second. The silent interval between the notes of successive phrases varied from 0.011 to 0.070 (average, 0.030) second, and made up from 11.74 to 71.72 (average, 34.68) percent of the total phrase length. In general, the shorter the phrases the more phrases there were in the song.

Song length.—The songs varied in length from 0.94 to 6.86 (average, 2.61) seconds.

Song patterns.—Since the phrases of a Chipping Sparrow song are generally all alike, the variations in different songs may best be classified on the basis of the character of the individual phrases of the song. The differences between songs are such that the delimiting of patterns is somewhat arbitrary, but the songs appeared to me to represent some 28 patterns, in eight principal groups:

A. The song a simple trill
  a. The phrases buzzy in quality
    I. The phrases 1-noted
      Pattern 1, figures 1–2
    II. The phrases 2-noted
      Pattern 2, figure 3
      Pattern 3, figure 4

b. The phrases not buzzy in quality

III. Each phrase a down-slurred note
Pattern 4, figures 5–6
Pattern 5, figure 7
Pattern 6, figure 8

IV. Each phrase a down-slur followed by an up-slur
Pattern 7, figure 9
Pattern 8, figure 10
Pattern 9, figure 11
Pattern 10, figures 12–16
Pattern 11, figures 17–18
Pattern 12, figures 19–20
Pattern 13, figure 21
Pattern 14, figures 22–23

V. Each phrase a single note consisting of an up-slur, a down-slur, and an up-slur
Pattern 15, figure 24

VI. Each phrase beginning with an up-slur, the rest of the phrase down-slurred to a pitch lower than the lowest pitch in the initial up-slur
Pattern 16, figure 25
Pattern 17, figures 26–27
Pattern 18, figures 28–29
Pattern 19, figure 30
Pattern 20, figure 31
Pattern 21, figure 32
Pattern 22, figures 33–35
Pattern 23, figure 36
Pattern 24, figure 37
Pattern 25, figure 38

VII. Each phrase an up-slur over an octave or more, then a down-slur over about half an octave
Pattern 26, figure 39
Pattern 27, figure 40

B. The song a two-parted trill, the phrases not buzzy in quality

VIII. Each phrase type containing an up-slur and a down-slur, the second part phrases shorter
Pattern 28, figure 41

Each recording studied contained songs of only one pattern, and I have never observed a Chipping Sparrow change its song pattern during a period of singing. Two facts from this study suggest, however, that a given individual *may* sing songs of more than one pattern: (1) one pattern (No. 28, fig. 41, recording 3248) contained phrases of two different types; (2) two of the recordings, No. 2053 (pattern 14, fig. 22) and No. 2064 (pattern 18, fig. 28) were made in the same place and only a few hours apart, and are probably of the same bird.

Fifteen of the 28 patterns found occurred in more than one recording (the two recordings containing songs of pattern 9, Nos. 1703 and 1705, are probably of the same bird). Most of these 15 patterns occurred in recordings from different localities, and nine of them occurred in recordings from different states. The pattern found in the most recordings (pattern 10) was from five areas in Ohio and one area in Maine. Eight of the ten patterns occurring in the Maine recordings occurred also in the Ohio recordings, and one of the three patterns in the West Virginia recordings occurred also in the Ohio recordings.

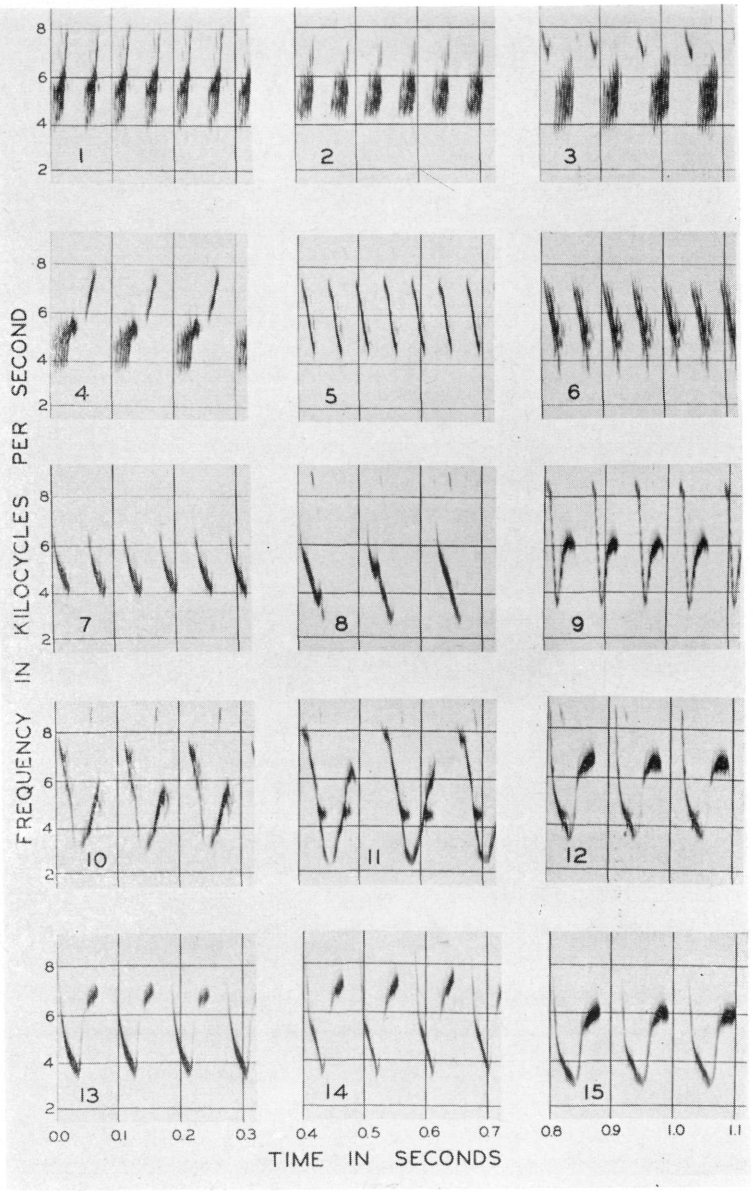

PLATE I, FIGURES 1–15. Audiospectrographs of portions of Chipping Sparrow songs. **1,** pattern 1 (1482B, Lincoln Co., Me.). **2,** pattern 1 (3287, New Albany, Ohio). **3,** pattern 2 (3017, Jefferson, Me.). **4,** pattern 3 (3529, Wiscasset, Me.). **5,** pattern 4 (799, Worthington, Ohio). **6,** pattern 4 (608, Lincoln Co., Me.). **7,** pattern 5 (3303, Reynoldsburg, Ohio). **8,** pattern 6 (3263, Wheeling, W. Va.). **9,** pattern 7 (797, Worthington, Ohio). **10,** pattern 8 (2645, New Albany, Ohio). **11,** pattern 9 (1705, University Park, Pa.). **12,** pattern 10 (1298, Columbus, Ohio). **13,** pattern 10 (3381, Highland Co., Ohio). **14,** pattern 10 (3244, Columbus, Ohio). **15,** pattern 10 (2998, Lincoln Co., Me.).

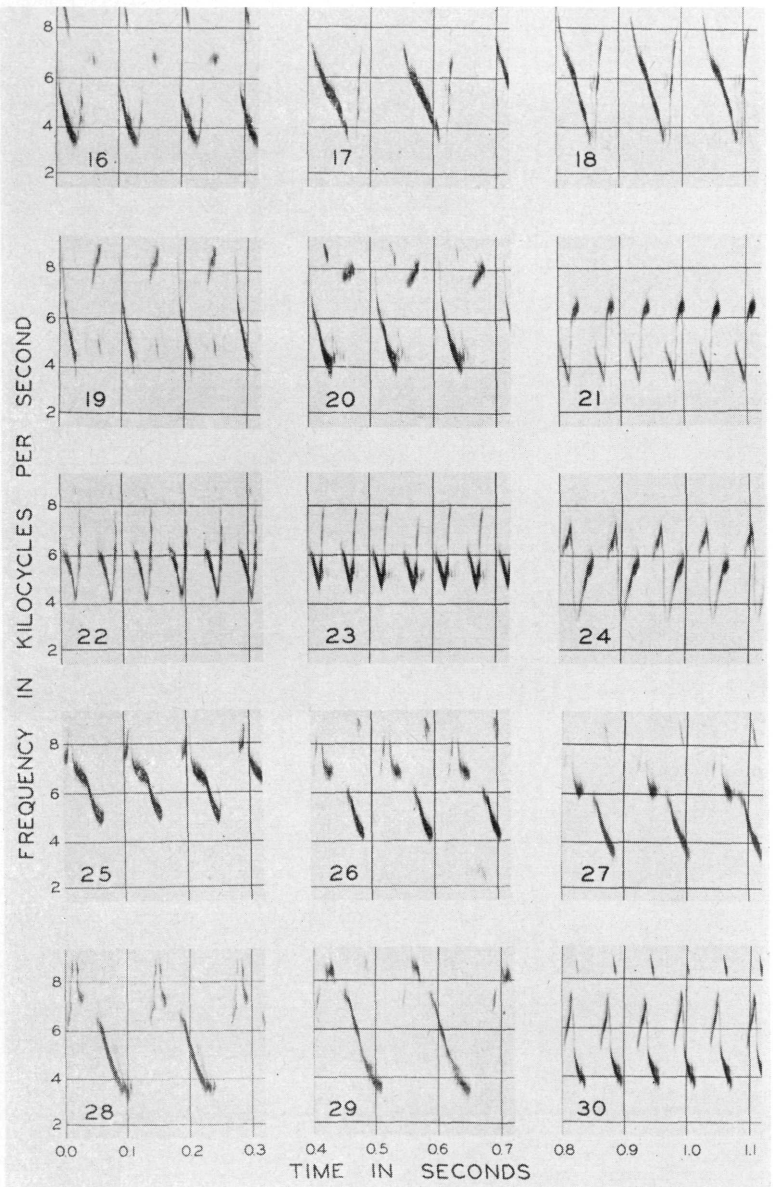

PLATE II, FIGURES 16–30. Audiospectrographs of portions of Chipping Sparrow songs. **16**, pattern 10 (953, Worthington, Ohio). **17,** pattern 11 (986, Columbus, Ohio). **18,** pattern 11 (3249, Columbus, Ohio). **19**, pattern 12 (3279, Wheeling, W. Va.). **20**, pattern 12 (1686, New Albany, Ohio). **21,** pattern 13 (2760, Oscoda Co., Mich.). **22,** pattern 14 (2053, Lincoln Co., Me.). **23,** pattern 14 (3328, Worthington, Ohio). **24,** pattern 15 (2477, New Albany, Ohio). **25**, pattern 16 (1527B, Lincoln Co., Me.). **26**, pattern 17 (666, Worthington, Ohio). **27**, pattern 17 (2997, Lincoln Co., Me.). **28,** pattern 18 (2064, Lincoln Co., Me.). **29,** pattern 18 (1718, New Albany, Ohio). **30**, pattern 19 (954, Worthington, Ohio).

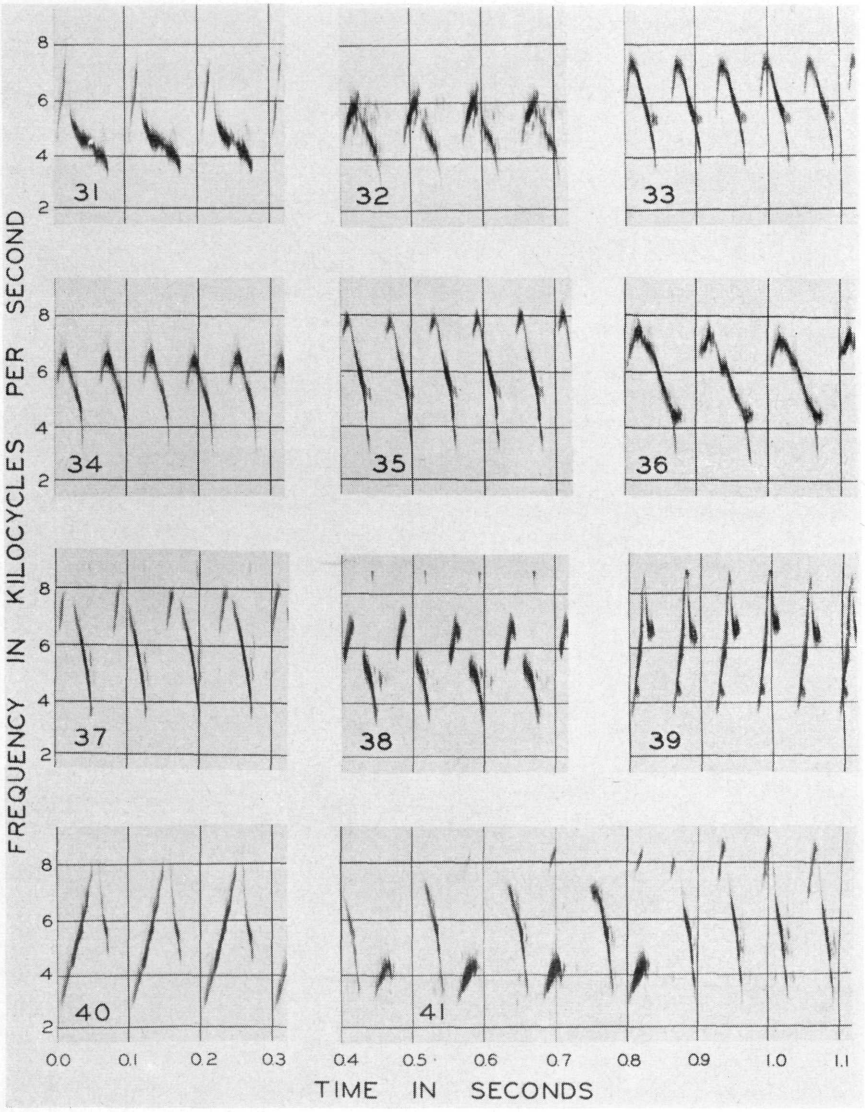

PLATE III, FIGURES 31–41. Audispectrographs of portions of Chipping Sparrow songs. **31,** pattern 20 (3250, Columbus, Ohio). **32,** pattern 21 (508, Lakeside, Ohio). **33,** pattern 22 (1770, New Albany, Ohio). **34,** pattern 22 (1980, Adams Co., Ohio). **35,** pattern 22 (3299, New Albany, Ohio). **36,** pattern 23 (1702, University Park, Pa.). **37,** pattern 24 (2223, Lincoln Co., Me.). **38,** pattern 25 (1974, Adams Co., Ohio). **39,** pattern 26 (1719, New Albany, Ohio). **40,** pattern 27 (3268, Wheeling, W. Va.). **41,** pattern 28 (3248, Columbus, Ohio, about the first third of the song).

Songs of a given pattern sung by different birds usually showed slight differences in the character and length of the phrases; several examples of the variation found within a pattern are shown in the figures (for example, fig. 1 and 2 of pattern 1. fig. 5 and 6 of pattern 4, and fig. 12–16 of pattern 10). Songs of a given pattern sung by different birds usually differed in phrase rate, sometimes by a considerable amount; for example, the phrase rate in the eight recordings of pattern 10 was as follows:

No. 953 (Worthington, Ohio)—13.9 phrases per second
No. 1298 (Columbus, Ohio)—9.6 phrases per second
No. 1306 (Zaleski, Ohio)—10.5 phrases per second
No. 2819 (Hocking Co., Ohio)—9.6 phrases per second
No. 2998 (Lincoln Co., Maine)—9.2 phrases per second
No. 3244 (Columbus, Ohio)—11.3 phrases per second
No. 3251 (Columbus, Ohio)—9.4 phrases per second
No. 3381 (Highland Co., Ohio)—11.5 phrases per second

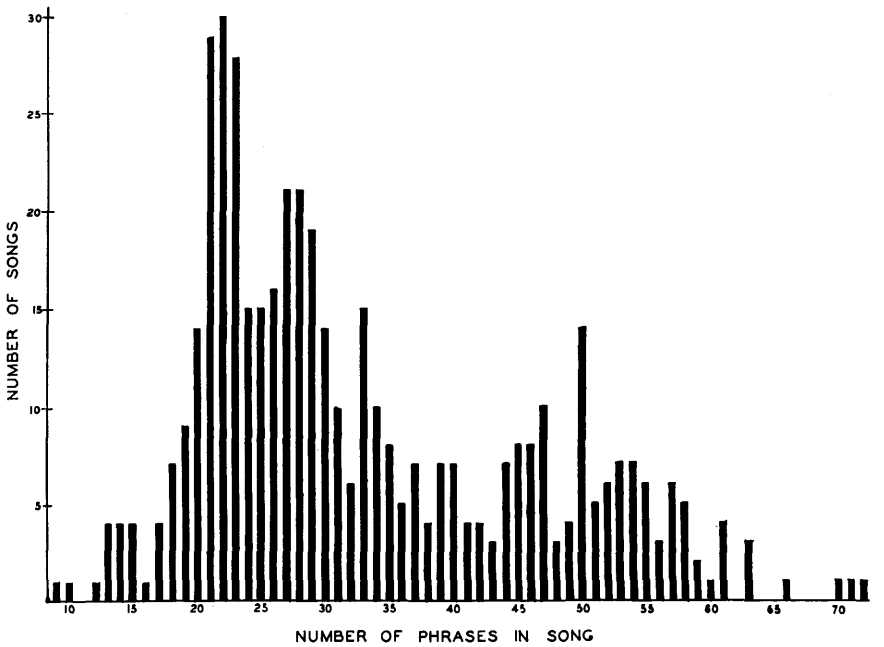

FIGURE 42. Graph showing the number of phrases in the 461 songs studied.

The differences between Maine and Ohio songs of the same pattern were no greater than the differences between different Ohio recordings of the same pattern. There was no evidence in the recordings studied of any significant geographic variation in song pattern in this species.

Frequencies.—The frequencies in most songs ranged from 3000 or 4000 to 7000 or 8000 cycles per second, which means that they were principally in the octave just above the upper limit of the piano range. The extremes of frequency in the 58 recordings were 2000 and 9000 cycles per second. The pitch range in a given song was at least an octave, and in a few songs was as much as two octaves.

Summary

This paper is based on an audiospectrographic analysis of 58 tape recordings of Chipping Sparrow songs; the recordings were from five states and contained

461 songs. Graphs of the songs showed that the notes are not of a uniform pitch, as previously published accounts indicate, but are slurred; the slurring is usually very abrupt, in some cases over an octave or more in 0.01 second. It is this abrupt slurring of the notes that gives the songs their dull and unmusical quality. The songs were simple trills (rarely a two-parted trill) containing 9–72 phrases uttered at rates of 6.9–22.5 phrases per second; each phrase contained from one to three notes. The songs varied in length from 0.94 to 6.86 seconds, and ranged in frequency from 2000 to 9000 cycles per second. The songs were classified in 28 patterns on the basis of the character of the individual phrases, and the patterns in eight groups; each pattern is illustrated by one or more audiospectrographs. Each recording contained songs of only one pattern, but it is possible that a given bird may sing songs of more than one pattern. Fourteen of the 28 patterns occurred in the songs of different birds, and nine of them in the songs of birds in different states. There was no evidence of any significant geographic variation in song pattern in this species.

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